PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION See Form PCT/IPEA/416	
9572WO/UR/FB		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/SE2004/002059	30-12-2004	31-12-2003
International Patent Classification (IPC) or national classification and IPC		
See Supplemental Box		
Applicant		
ABB AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 5 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
31-10-2005	29-03-2006
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Anna Lundqvist / MRo Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (April 2005)

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Cover sheet

International patent classification (IPC)
G01B 11/30 (2006.01)
B21B 37/28 (2006.01)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE2004/002059

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____ ,
which is the language of a translation furnished for the purposes of:

- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 1-19 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 1-5 received by this Authority on 20-02-2006
pages* _____ received by this Authority on _____

☒ the drawings:

pages 1-4 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing *(specify)*: _____
- ☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing *(specify)*: _____
- ☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE2004/002059

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-21	YES
	Claims		NO
Inventive step (IS)	Claims	1-21	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-21	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

This application concerns a method and device for optimizing measurement and control of the flatness of a strip and rolled material. The method includes mapping by associating to flatness fault types a reference strip model and an actuator space conversion matrix.

Reference is made to the following documents:
D1: EP 1110635 A1
D2: US 5583639 A
D3: US 6351269 B1
D4: US 6275032 B1

Document D1, which is considered to represent the most relevant state of the art, describes a method and device for controlling flatness of rolled material, from which the subject-matter of claims 1 and 14 differs in that it creates a set of reference strip models and a set of space conversion matrices, visualizes the strip, determines a relevant flatness fault type, morphs the visual picture and chooses an associated actuator space conversion matrix.
The subject-matter of claims 1 and 14 is therefore novel (Article 33(2) PCT).
Claims 2-13 and 15-21 are dependent on claims 1 and 14 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Documents D2-D4 only represent the general state of the art.

The invention is industrially applicable.

Claims

1. Method for optimizing measurement and control of the flatness of a strip of rolled material,
characterized by,
- creating a set of reference strip models for known flatness fault types,
- creating a set of space conversion matrices, which are known to correct the known flatness fault types by optimally qualifying actuator behaviour during flatness control for the given flatness error type,
- visualizing the strip,
- determining the relevant flatness fault type by comparing the visualization to one or more reference strip models,
- fusion or morphing the visual picture with the measured information,
- choosing an associated actuator space conversion matrix,
- optimizing the control with the space conversion matrix.

2. Method according to claim 1,
characterized by,
- that a mapping is made between measurement and control and done by associating to relevant flatness fault types a reference strip model and an actuator space conversion matrix.

3. Method according to any of the preceding claims,
characterized by,
- that an enhanced mapping is made between measurement and control by an actuator correction algorithm using morphed informaton.

4. Method according to any of the preceding claims,

characterized by,

- mapping each reference strip model to its corresponding vector space conversion matrix according to the flatness fault type.

5. Method according to any of the preceding claims, **characterized by,**

- selecting a reference strip model by comparing available reference strip models with the actual strip.

6. Method according to any of the preceding claims, **characterized by,**

- enhancing the measured data by interpolating the reference model with measured flatness data, i.e. by using morphing.

7. Method according to any of the preceding claims, **characterized by,**

- converting actual strip to the visualization format used for reference strip models.

8. Method according to any of the preceding claims, **characterized by,**

- having visual access to the strip by an operator.

9. Method according to any of the preceding claims, **characterized by,**

- comparing reference strip models with actual strip visualization format.

10. Method according to any of the preceding claims, **characterized by,**

- manually tuning the automatic comparison.

11. Method according to any of the preceding claims, **characterized by,**
- synchronizing measured data with video samples and with the currently performed optimization algorithm.

12. Method according to any of the preceding claims, **characterized by,**
- using a morphing technique.

13. Method according to any of the preceding claims, **characterized by,**
- adding the result of the mapping by morphing to the measured information from a reference model.

14. Device for optimizing measurement and control of the flatness of a strip of rolled material, **characterized by,**
- means for creating a set of reference strip models for known flatness fault types,
- means for creating a set of space conversion matrices, which are known to correct the known flatness fault types by optimally qualifying actuator behaviour during flatness control for the given flatness error type,
- means for visualizing the strip,
- means for determining the relevant flatness fault type by comparing the visualization to one or more reference strip models,
- means for fusion or morphing the visual picture with the measured information,
- means for choosing an associated actuator space conversion matrix,

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- means for optimizing the control with the space conversion matrix.

15. Device according to claim 14,
characterized by,
- means for accomplishing a mapping by associating to relevant flatness fault types a reference strip model and an actuator space conversion matrix.

16. Device according to claim 14 or 15,
characterized by,
- having means for making the mapping between measurement and control.

17. Device according to claim 14 - 16,
characterized by,
- having means for making the mapping between measurement and control by an actuator correction algorithm.

18. Device according to any of the claims 14-17,
characterized by,
- means for mapping each reference strip model to its corresponding vector space conversion matrix according to the flatness fault type.

19. A computer program comprising computer program code means for carrying out the steps of a method according to claims 1-13.

20. A computer readable medium comprising at least part of a computer program according to claim 19.

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21. A computer program, according to claim 19, that is, at least partially, provided through a network, such as e.g. internet.

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